

MAIL STOP  
AMENDMENT

*JFW*

UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: L.R. Dalton et al. Attorney Docket No.: UWOTL117403  
Application No.: 09/912,444 Group Art Unit: 1712  
Filed: July 24, 2001 Examiner: D.S. Metzmaier  
Title: HYPERPOLARIZABLE ORGANIC CHROMOPHORES

AMENDMENT A

Seattle, Washington 98101

September 3, 2004

TO THE COMMISSIONER FOR PATENTS:

INTRODUCTORY COMMENTS

In response to the Examiner's Action mailed June 9, 2004, please amend the above-identified patent application as indicated below.

Adjustment Date: 05/03/2005 SDIRETA1  
09/21/2004 ASELLMAN 00000004 031740 09912444  
01 FC:1201 258.00 CR  
02 FC:1202 54.00 CR

09/21/2004 ASELLMAN 00000004 031740 09912444

01 FC:1201 258.00 DA  
02 FC:1202 54.00 DA

UWOTL117403.AM1.DOC

-1-

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: L.R. Dalton et al. Attorney Docket No.: UWOTL117403  
 Application No.: 09/912,444 Group Art Unit: 1712  
 Filed: July 24, 2001 Examiner: D.S. Metzmaier  
 Title: HYPERPOLARIZABLE ORGANIC CHROMOPHORES

REQUEST FOR REFUND  
(IMPROPER CHARGE OF DEPOSIT ACCOUNT)

Seattle, Washington 98101

March 11, 2005

DIRECTOR – U.S. PATENT AND TRADEMARK OFFICE:

ATTENTION: Refund Section, Accounting Division, Office of Finance

I. Refund Request

This is a request for refund with respect to the charge to Deposit Account No. 03-1740, shown on the statement dated September 2004, for the above-identified patent application. A copy of the monthly statement, in which the error referred to occurs, accompanies this request (see **Exhibit A**).

II. Fees Charged for Which Refund Requested

	Amount of Fee Requested
Excess Claims	\$312.00
<u>Total Refund Requested:</u>	<b>\$312.00</b>

III. Explanation of Why Contested Charge Is in Error

When this application was originally filed on July 24, 2001, 8 claims were submitted for examination. However, on February 28, 2002, a Preliminary Amendment was filed canceling Claims 1-8 and adding Claims 9-64 (for a total of 56 claims) (see **Exhibit B**). The fee for the additional claims was paid at that time by our Check No. 124010 (see **Exhibit C**). On September 3, 2004, Amendment A was filed, canceling Claims 1-28, 30, and 35-64, and adding 9 additional claims (Claims 65-73) for a total of 23 claims (See **Exhibit D**). Because 56 claims were paid for on February 28, 2002 (9 independent and 47 dependent), and only 23 claims

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remain (7 independent and 16 dependent), applicants' attorney's deposit account should not have been charged the excess claim fees in the total amount of \$312.00.

IV. Manner of Refund

Please make refund by crediting Deposit Account No. 03-1740.

Respectfully submitted,

CHRISTENSEN O'CONNOR  
JOHNSON KINDNESS<sup>PLLC</sup>

*George E. Renzoni*

George E. Renzoni, Ph.D.  
Registration No. 37,919  
Direct Dial No. 206.695.1755

I hereby certify that this correspondence is being deposited with the U.S. Postal Service in a sealed envelope as first class mail with postage thereon fully prepaid and addressed to Mail Stop 16, Director - U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450, on the below date.  
Date: March 11, 2005

GER:md

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**United States  
Patent and  
Trademark Office**



**Deposit Account Statement**

Requested Statement Month: September 2004  
 Deposit Account Number: 031740  
 Name: CHRISTENSEN O'CONNOR JOHNSON & KINDNESS  
 Attention:  
 Address: 2800 PACIFIC FIRST CENTRE  
 City: SEATTLE  
 State: WA  
 Zip: 98101

DATE	SEQ	POSTING REF TXT	ATTORNEY DOCKET NBR	FEE CODE	AMT	BAL
09/01	12	E-		9203	-\$10,000.00	\$11,361.00
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## Deposit Account Statement

Page 3 of 4

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09/13 1011 10769103		8021	\$40.00	\$12,002.00
09/14 6 2829757	NOAM-2-27229	8521	\$40.00	\$11,962.00
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09/14 295 10676730	BCL-VANS121762	8007	\$180.00	\$11,773.00
09/14 499 78482739	SHOE-2-31619	7001	\$335.00	\$11,438.00
09/14 1419 2250110	ASSG-2-16187	7205	\$100.00	\$11,338.00
09/14 1420 2250110	ASSG-2-16187	7208	\$200.00	\$11,138.00
09/15 5 PCT/US04/24608		9204	-\$48.00	\$11,186.00
09/15 177 09966814	VIGL118030	2251	\$55.00	\$11,131.00
09/15 539 78483529	MLLA-2-31709	7001	\$335.00	\$10,796.00
09/15 679 76222095	STIB-2-22662	7004	\$450.00	\$10,346.00
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09/16 6 10880842	23251:55SAH	8007	\$100.00	\$10,243.00
09/16 9 1826470	AMEJ-2-11100	8521	\$40.00	\$10,203.00
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09/16 363 1826470	AMEJ211100	7206	\$100.00	\$9,548.00
09/16 364 1826470	AMEJ211100	7203	\$100.00	\$9,448.00
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09/17 545 75703957	HCPC-2-20659	7004	\$300.00	\$8,588.00
09/17 751 10836609	VANS122471	8021	\$40.00	\$8,548.00
09/17 753 10484028	KONC122199	8021	\$40.00	\$8,508.00
09/20 6 09476203	WPTA522610	8021	\$40.00	\$8,468.00
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09/20 436 0139220257	668	8014	\$100.00	\$8,183.00
09/20 1092 78486064	JORC231616	7001	\$670.00	\$7,513.00
09/20 1111 78486083	JORC231617	7001	\$670.00	\$6,843.00
09/21 1 09860282	WSUR117467	1252	\$310.00	\$6,533.00
09/21 5 09812472		8013	\$358.00	\$6,175.00
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09/21 87 2635612	VANS-2-18108	8522	\$50.00	\$5,796.00

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09/03 1099 10823080	PAWO122425	8021	\$40.00	\$6,483.00
09/03 1109 60554809		8021	\$40.00	\$6,443.00
09/03 1255 78478530	TARB-2-31688	7001	\$335.00	\$6,108.00
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09/07 196 10490222	INOL122616	8021	\$40.00	\$5,731.00
09/07 230 78130594	DIAC230682	7004	\$150.00	\$5,581.00
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09/07 982 10737726	MSFT121843	8021	\$40.00	\$4,611.00
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09/08 209 60547129	MEGC122490	8021	\$40.00	\$4,083.00
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09/09 1139 60527517	KCOR122107	8021	\$40.00	\$3,676.00
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09/10 30 78388476	ENTE230986;31170;31169	8521	\$40.00	\$4,532.00
09/10 31 78388476	ENTE230986;31170;31169	8522	\$50.00	\$4,482.00
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09/13 284 PCT/US04/28873	CEZT123366	1602	\$700.00	\$12,872.00
09/13 285 10880049	MSFT122607	8021	\$40.00	\$12,832.00

# Deposit Account Statement

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09/21 149 0150790044	MSFTF123282/85	8014	\$50.00	\$5,746.00
09/21 385 10888428	UWOTL123213	8021	\$40.00	\$5,706.00
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09/22 246 10688659	BCL-XANI121851	8007	\$20.00	\$5,646.00
09/22 262 29203216	SUIK122650	8021	\$40.00	\$5,606.00
START	SUM OF	SUM OF	END	
BALANCE	CHARGES	REPLENISH	BALANCE	
\$1,361.00	\$16,797.00	\$21,042.00	\$5,606.00	

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BOX MISSING PARTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: L.R. Dalton et al. Attorney Docket No.: UWOTL117403  
Application No.: 09/912,444 Group Art Unit: 2874  
Filed: July 24, 2001  
Title: HYPERPOLARIZABLE ORGANIC CHROMOPHORES

TRANSMITTAL OF MISSING PARTS OF PATENT APPLICATION/  
REQUEST FOR RECORDATION OF ASSIGNMENT/  
REQUEST FOR EXTENSION OF TIME

February 28, 2002

TO THE COMMISSIONER FOR PATENTS:

A. Transmitted herewith are the following:

- X 1. An executed Combined Declaration and Power of Attorney.
- X 2. An Assignment of the invention to University of Washington. A Recordation Form Cover Sheet prepared in accordance with 37 C.F.R. § 3.31 is attached to the Assignment, along with a separate check for the recordation fee. Please record this Assignment in accordance with 37 C.F.R. § 3.11.
- X 3. A copy of the Notice to File Missing Parts.
- X 4. The following additional documents: Substitute Formal Drawings; Preliminary Amendment
- X 5. Small entity status is asserted for this matter.

COMPUTATION OF FEE

	Number Filed		Number Extra		Rate	
Basic Fee						370
Total Claims	56 - 20	=	36	x	9	= 324
Independent Claims	9 - 3	=	6	x	42	= 252
Surcharge				+	65	65
Extension of Time				+	720	720
TOTAL						\$1731

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B. Request for Extension of Time

Applicants respectfully request that the shortened statutory period for response to the outstanding Office Action dated August 31, 2001, set to expire on October 31, 2001, be extended by 4 months, to expire on February 28, 2002. The enclosed check includes the 4-month extension fee of \$720.00.

C. Fees Enclosed

Enclosed is our Check No. 124010 in the amount of \$1731.00 to cover the requisite fees.

D. Additional Fee Charges or Credit for Overpayment

The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17 and 1.18 which may be required during the entire pendency of the application, or credit any overpayment, to Deposit Account No. 03-1740. This authorization also hereby includes a request for any extensions of time of the appropriate length required upon the filing of any reply during the entire prosecution of this application. A copy of this document is enclosed.

Respectfully submitted,

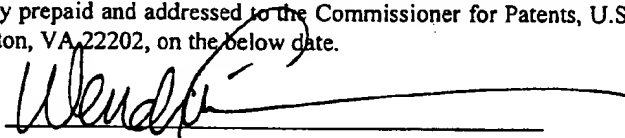
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George E. Renzoni, Ph.D.  
Registration No. 37,919  
Direct Dial No. 206.695.1755

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Date: February 28, 2002



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: L.R. Dalton et al. Attorney Docket No.: UOFW117403  
Application No.: 09/912,444 Group Art Unit: 2874  
Filed: July 24, 2001 Examiner: --  
Title: HYPERPOLARIZABLE ORGANIC CHROMOPHORES

PRELIMINARY AMENDMENT

Seattle, Washington 98101

February 28, 2002

TO THE COMMISSIONER FOR PATENTS:

Prior to examination, please amend the above-identified application as indicated below.

In the Specification:

Please amend the paragraph on page 40, beginning at line 15, as follows:

The electro-optic coefficient (picometers/volt, pm/V, at 1.3 microns),  $r_{33}$ , as a function of chromophore loading (weight percent) was determined as described above for a corresponding chromophore having a tricyanofuran acceptor in amorphous polycarbonate. The results are illustrated in FIGURE 18. Referring to FIGURE 18, the greatest electro-optic coefficient (66 pm/V) was measured at 30 weight percent chromophore and electro-optic coefficients of 64 pm/V were achieved for loadings of 28 and 35 weight percent chromophore. Electro-optic coefficients of 47 and 57 pm/V were achieved at 20 and 30 weight percent chromophore, respectively.

In the Claims:

Please cancel Claims 1-8.

Add Claims 9-64 as follows:

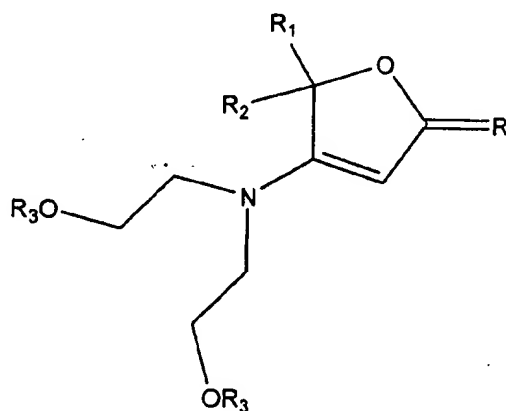
9. (New) A compound, comprising a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  $\pi$ -conjugated polyene bridge, the compound having an electro-optic coefficient of at least about 50 pm/V measured at 1.3 or 1.55  $\mu\text{m}$  in polymethylmethacrylate with

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a compound loading of about 25% by weight based on the total weight of polymethylmethacrylate.

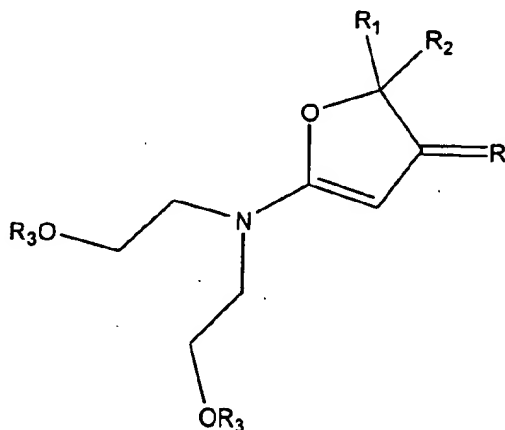
10. (New) The compound of Claim 9, wherein the donor comprises an amino donor.

11. (New) The compound of Claim 9, wherein the donor comprises an amino group conjugated to the polyene through an  $\alpha,\beta$ -unsaturated cyclic ester equivalent having the structure:



wherein  $R_1$  and  $R_2$  are alkyl groups,  $R_3$  is a bulky substituent, and  $R$  represents the rest of the compound.

12. (New) The compound of Claim 9, wherein the donor comprises an amino group conjugated to the polyene through an  $\alpha,\beta$ -unsaturated cyclic ether equivalent having the structure:

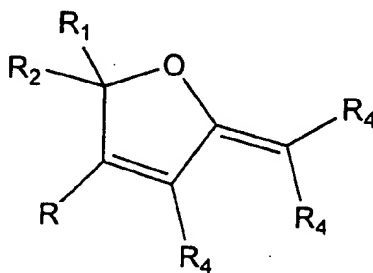


wherein  $R_1$  and  $R_2$  are alkyl groups,  $R_3$  is a bulky substituent, and  $R$  represents the rest of the compound.

13. (New) The compound of Claim 9, wherein the donor comprises a bulky substituent to inhibit chromophore aggregation.

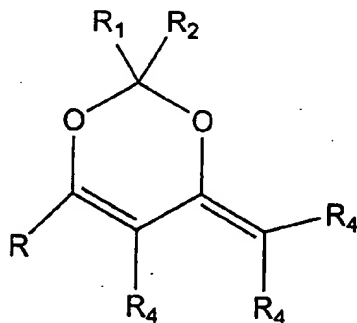
14. (New) The compound of Claim 9, wherein the acceptor comprises a cyanofuran acceptor.

15. (New) The compound of Claim 9, wherein the acceptor comprises a furan group having the structure:



wherein  $R_1$  and  $R_2$  are alkyl groups,  $R_4$  is independently selected from F, CN,  $CF_3$ , and  $CF_3SO_2$ , and R represents the rest of the compound.

16. (New) The compound of Claim 9, wherein the acceptor comprises a furan group having the structure:



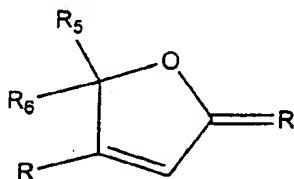
wherein  $R_1$  and  $R_2$  are alkyl groups,  $R_4$  is independently selected from F, CN,  $CF_3$ , and  $CF_3SO_2$ , and R represents the rest of the compound.

17. (New) The compound of Claim 9, wherein the acceptor comprises a bulky substituent to inhibit chromophore aggregation.

18. (New) The compound of Claim 9, wherein the bridge comprises a bulky substituent to inhibit chromophore aggregation.

19. (New) The compound of Claim 9, wherein the  $\pi$ -conjugated polyene bridge comprises a dihydrofuran group.

20. (New) The compound of Claim 9, wherein the  $\pi$ -conjugated polyene bridge comprises a dihydrofuran group having the structure:

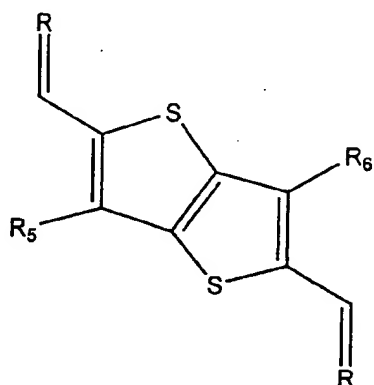


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wherein  $R_5$  and  $R_6$  are selected from alkyl groups, and  $R$  represents the rest of the compound.

21. (New) The compound of Claim 9, wherein the  $\pi$ -conjugated polyene bridge comprises a fused dithiophene group.

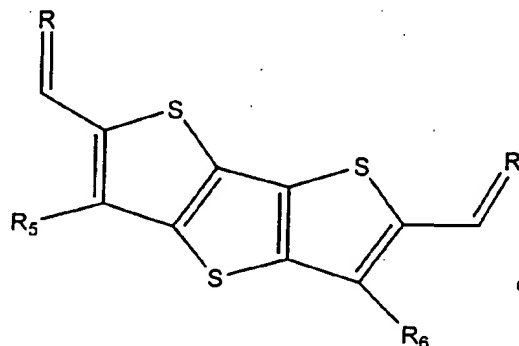
22. (New) The compound of Claim 9, wherein the  $\pi$ -conjugated polyene bridge comprises a fused dithiophene group having the structure:



wherein  $R_5$  and  $R_6$  are selected from alkyl, t-butyl dimethyl silyl, and perfluoropropyl dimethyl silyl groups, and  $R$  represents the rest of the compound.

23. (New) The compound of Claim 9, wherein the  $\pi$ -conjugated polyene bridge comprises a fused trithiophene group.

24. (New) The compound of Claim 9, wherein the  $\pi$ -conjugated polyene bridge comprises a fused trithiophene group having the structure:

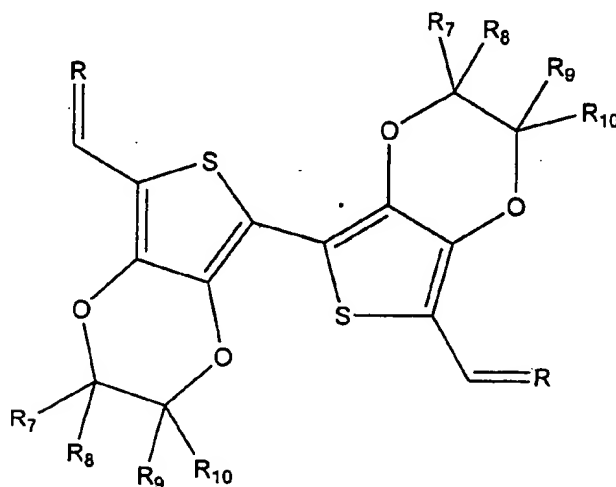


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wherein  $R_5$  and  $R_6$  are alkyl groups, and  $R$  represents the rest of the compound.

25. (New) The compound of Claim 9, wherein the  $\pi$ -conjugated polyene bridge comprises a dithiophene group.

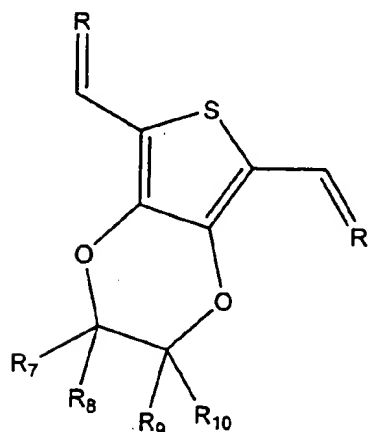
26. (New) The compound of Claim 9, wherein the  $\pi$ -conjugated polyene bridge comprises a dithiophene group having the structure:



wherein  $R_7$ ,  $R_8$ ,  $R_9$ , and  $R_{10}$  are independently selected from hydrogen, alkyl, fluorine, and trimethylfluoro groups; and  $R$  represents the rest of the compound.

27. (New) The compound of Claim 9, wherein the  $\pi$ -conjugated polyene bridge comprises a substituted thiophene group.

28. (New) The compound of Claim 9, wherein the  $\pi$ -conjugated polyene bridge comprises a substituted thiophene group having the structure:

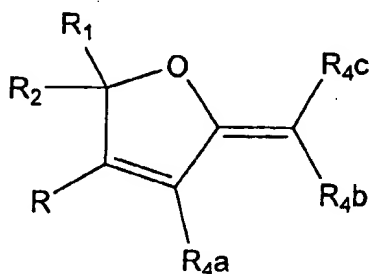


wherein  $R_7$ ,  $R_8$ ,  $R_9$ , and  $R_{10}$  are independently selected from hydrogen, alkyl, fluorine, and trimethylfluoro groups; and  $R$  represents the rest of the compound.

29. (New) A compound, comprising a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  $\pi$ -conjugated polyene bridge, wherein the bridge comprises a fused dithiophene group.

30. (New) A compound, comprising a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  $\pi$ -conjugated polyene bridge, wherein the bridge comprises a fused trithiophene group.

31. (New) A compound, comprising a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  $\pi$ -conjugated polyene bridge, wherein the acceptor comprises a furan group having the structure:





wherein  $R_1$  and  $R_2$  are alkyl groups,  $R_{4a}$ ,  $R_{4b}$ , and  $R_{4c}$  are independently selected from F, CN,  $CF_3$ , and  $CF_3SO_2$ , provided that  $R_{4a}$ ,  $R_{4b}$ , and  $R_{4c}$  are not all CN, and R represents the rest of the compound.

32. (New) The compound of Claim 31, wherein  $R_{4a}$ ,  $R_{4b}$ , and  $R_{4c}$  are independently selected from F,  $CF_3$ , and  $CF_3SO_2$ .

33. (New) The compound of Claim 31, wherein  $R_{4a}$  is CN,  $R_{4b}$  is CN, and  $R_{4c}$  is  $CF_3SO_2$ .

34. (New) The compound of Claim 31, wherein  $R_{4a}$  is  $CF_3SO_2$ ,  $R_{4b}$  is CN, and  $R_{4c}$  is  $CF_3SO_2$ .

35. (New) A macromolecular structure, comprising the compound of Claim 9.

36. (New) The macromolecular structure of Claim 35, wherein the structure is a dendrimer.

37. (New) The macromolecular structure of Claim 36, wherein the dendrimer comprises a crosslinkable dendrimer.

38. (New) The macromolecular structure of Claim 35, wherein the structure is a polymer.

39. (New) The macromolecular structure of Claim 38, wherein the polymer comprises a crosslinkable polymer.

40. (New) A macromolecular structure, comprising the compound of Claim 29.

41. (New) The macromolecular structure of Claim 40, wherein the structure is a dendrimer.

42. (New) The macromolecular structure of Claim 41, wherein the dendrimer comprises a crosslinkable dendrimer.

43. (New) The macromolecular structure of Claim 40, wherein the structure is a polymer.
44. (New) The macromolecular structure of Claim 43, wherein the polymer comprises a crosslinkable polymer.
45. (New) A macromolecular structure, comprising the compound of Claim 30.
46. (New) The macromolecular structure of Claim 45, wherein the structure is a dendrimer.
47. (New) The macromolecular structure of Claim 46, wherein the dendrimer comprises a crosslinkable dendrimer.
48. (New) The macromolecular structure of Claim 45, wherein the structure is a polymer.
49. (New) The macromolecular structure of Claim 48, wherein the polymer comprises a crosslinkable polymer.
50. (New) A macromolecular structure, comprising the compound of Claim 31.
51. (New) The macromolecular structure of Claim 50, wherein the structure is a dendrimer.
52. (New) The macromolecular structure of Claim 51, wherein the dendrimer comprises a crosslinkable dendrimer.
53. (New) The macromolecular structure of Claim 50, wherein the structure is a polymer.
54. (New) The macromolecular structure of Claim 53, wherein the polymer comprises a crosslinkable polymer.
55. (New) A nonlinear optical device, comprising an active element including the compound of Claim 9.

56. (New) A nonlinear optical device, comprising an active element including the compound of Claim 29.

57. (New) A nonlinear optical device, comprising an active element including the compound of Claim 30.

58. (New) A nonlinear optical device, comprising an active element including the compound of Claim 31.

59. (New) A dendrimer, comprising a chromophore having a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  $\pi$ -conjugated polyene bridge, wherein the bridge comprises a thiophene group.

60. (New) A dendrimer, comprising a chromophore having a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  $\pi$ -conjugated polyene bridge, wherein the bridge comprises a bithiophene group.

61. (New) A dendrimer, comprising a chromophore having a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  $\pi$ -conjugated polyene bridge, wherein the bridge comprises a fused dithiophene group.

62. (New) A dendrimer, comprising a chromophore having a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  $\pi$ -conjugated polyene bridge, wherein the bridge comprises a fused trithiophene group.

63. (New) A dendrimer, comprising a chromophore having a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  $\pi$ -conjugated polyene bridge, wherein the acceptor comprises a furan group.

64. (New) A dendrimer, comprising the compound of Claim 1.

**REMARKS**

By this amendment, Claims 1-8 have been canceled and Claims 9-64 have been added.  
Examination and allowance of Claims 9-64 are respectfully requested.

Respectfully submitted,

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*George E. Renzoni*

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE FEBRUARY 28, 2002**

In the Specification:

The paragraph on page 40, beginning at line 11 has been amended as follows:

The electro-optic coefficient (picometers/volt, pm/V, at 1.3 microns),  $r_{33}$ , as a function of chromophore loading (weight percent) was determined as described above for a corresponding chromophore having a tricyanofuran acceptor [this chromophore] in amorphous polycarbonate. The results are illustrated in FIGURE 18. Referring to FIGURE 18, the greatest electro-optic coefficient (66 pm/V) was measured at 30 weight percent chromophore and electro-optic coefficients of 64 pm/V were achieved for loadings of 28 and 35 weight percent chromophore. Electro-optic coefficients of 47 and 57 pm/V were achieved at 20 and 30 weight percent chromophore, respectively.

Claims 1 - 8 have been cancelled and Claims 9 - 64 have been added.

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File No.: UWOTL-1-17403

Atty/Secy: GER/md/ws

Date: 2/28/02

Appln. No.: 09/912,444

Filed: 7/24/01

Applicant(s): L.R. Dalton et al.

Title: HYPERPOLARIZABLE ORGANIC CHROMOPHORES

The following have been received in the U.S. Patent and Trademark Office on the date stamped hereon via first-class mail, with a signed Certificate of Mailing:

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Assignment (10 pages)

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formal drawings/45 sheets



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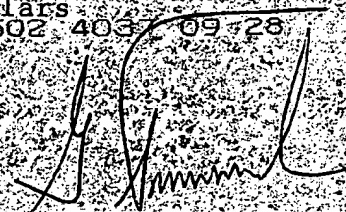
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MAIL STOP  
AMENDMENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: L.R. Dalton et al. Attorney Docket No.: UWOTL117403  
Application No.: 09/912,444 Group Art Unit: 1712  
Filed: July 24, 2001 Examiner: D.S. Metzmaier  
Title: HYPERPOLARIZABLE ORGANIC CHROMOPHORES

AMENDMENT TRANSMITTAL LETTER

Seattle, Washington 98101

September 3, 2004

TO THE COMMISSIONER FOR PATENTS:

A. Amendment Transmittal

Transmitted herewith is an amendment in the above-identified application. No additional claim fee is required, as shown below.

COMPUTATION OF FEE FOR CLAIMS AS AMENDED

	Claims Remaining After Amendment		Highest Number Previously Paid For		Present Extra	Rate		Additional Fee
Total Claims	23	-	56	=	0	x	9	= 0
Independent Claims	7	-	9	=	0	x	43	= 0
TOTAL								\$0

B. Additional Fee Charges or Credit for Overpayment

The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17 and 1.18 which may be required during the entire pendency of the application, or credit any overpayment, to Deposit Account No. 03-1740. This authorization also hereby includes a request

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for any extensions of time of the appropriate length required upon the filing of any reply during the entire prosecution of this application.

Respectfully submitted,

CHRISTENSEN O'CONNOR  
JOHNSON KINDNESS<sup>PLLC</sup>

*George E. Renzoni*

George E. Renzoni, Ph.D.  
Registration No. 37,919  
Direct Dial No. 206.695.1755

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Date:

*September 3, 2004*

*George E. Renzoni*

GER:md

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**MAIL STOP  
AMENDMENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicants: L.R. Dalton et al. Attorney Docket No.: UWOTL117403  
Application No.: 09/912,444 Group Art Unit: 1712  
Filed: July 24, 2001 Examiner: D.S. Metzmaier  
Title: HYPERPOLARIZABLE ORGANIC CHROMOPHORES

**AMENDMENT A**

Seattle, Washington 98101

September 3, 2004

TO THE COMMISSIONER FOR PATENTS:

**INTRODUCTORY COMMENTS**

In response to the Examiner's Action mailed June 9, 2004, please amend the above-identified patent application as indicated below.

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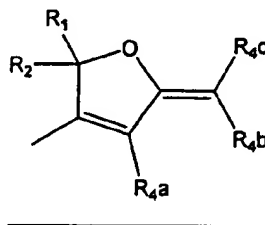
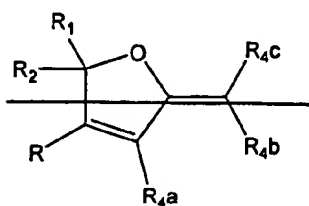
### AMENDMENTS TO THE CLAIMS

1-28. (Canceled)

29. (Currently amended) A compound, comprising a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  ~~$\pi$ -conjugated polyene~~ bridge, wherein the acceptor comprises a dihydrofuran group, wherein the bridge comprises a fused dithiophene group.

30. (Canceled)

31. (Currently amended) A compound, comprising a  $\pi$ -electron donor conjugated to a  $\pi$ -electron acceptor through a  ~~$\pi$ -conjugated polyene~~ bridge, wherein the acceptor comprises a ~~furan~~ group having the structure:



wherein R<sub>1</sub> and R<sub>2</sub> are alkyl groups, R<sub>4a</sub>, R<sub>4b</sub>, and R<sub>4c</sub> are independently selected from F, CN, CF<sub>3</sub>, and CF<sub>3</sub>SO<sub>2</sub>, provided that R<sub>4a</sub>, R<sub>4b</sub>, and R<sub>4c</sub> are not all CN, ~~and R represents the rest of the compound.~~

32. (Original) The compound of Claim 31, wherein R<sub>4a</sub>, R<sub>4b</sub>, and R<sub>4c</sub> are independently selected from F, CF<sub>3</sub>, and CF<sub>3</sub>SO<sub>2</sub>.

33. (Original) The compound of Claim 31, wherein R<sub>4a</sub> is CN, R<sub>4b</sub> is CN, and R<sub>4c</sub> is CF<sub>3</sub>SO<sub>2</sub>.

34. (Original) The compound of Claim 31, wherein R<sub>4a</sub> is CF<sub>3</sub>SO<sub>2</sub>, R<sub>4b</sub> is CN, and R<sub>4c</sub> is CF<sub>3</sub>SO<sub>2</sub>.

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35-64. (Canceled)

65. (New) The compound of Claim 31, wherein  $R_{4a}$ ,  $R_{4b}$ , and  $R_{4c}$  are independently selected from CN,  $CF_3$ , and  $CF_3SO_2$ .

66. (New) The compound of Claim 31, wherein  $R_{4a}$  is F,  $R_{4b}$  is CN, and  $R_{4c}$  is F.

67. (New) The compound of Claim 31, wherein  $R_{4a}$  is  $CF_3$ ,  $R_{4b}$  is CN, and  $R_{4c}$  is  $CF_3$ .

68. (New) The compound of Claim 31, wherein  $R_{4a}$  is  $CF_3SO_2$ ,  $R_{4b}$  is  $CF_3SO_2$ , and  $R_{4c}$  is  $CF_3SO_2$ .

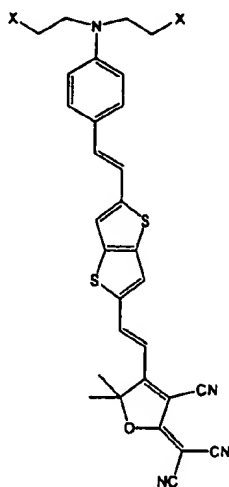
69. (New) The compound of Claim 31, wherein  $R_{4a}$  is CN,  $R_{4b}$  is  $CF_3SO_2$ , and  $R_{4c}$  is  $CF_3SO_2$ .

70. (New) The compounds shown in FIGURE 21.

71. (New) The compound shown in FIGURE 26.

72. (New) The compound shown in FIGURE 47.

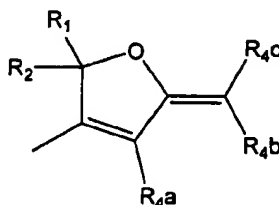
73. (New) A compound having the structure:



wherein X is hydrogen or *t*-butyldimethylsiloxy.

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74. (New) A substituent for a nonlinear optical material having the structure:



wherein R<sub>1</sub> and R<sub>2</sub> are alkyl groups, R<sub>4a</sub>, R<sub>4b</sub>, and R<sub>4c</sub> are independently selected from F, CN, CF<sub>3</sub>, and CF<sub>3</sub>SO<sub>2</sub>, provided that R<sub>4a</sub>, R<sub>4b</sub>, and R<sub>4c</sub> are not all CN.

75. (New) The compound of Claim 74, wherein R<sub>4a</sub>, R<sub>4b</sub>, and R<sub>4c</sub> are independently selected from F, CF<sub>3</sub>, and CF<sub>3</sub>SO<sub>2</sub>.

76. (New) The compound of Claim 74, wherein R<sub>4a</sub> is CN, R<sub>4b</sub> is CN, and R<sub>4c</sub> is CF<sub>3</sub>SO<sub>2</sub>.

77. (New) The compound of Claim 74, wherein R<sub>4a</sub> is CF<sub>3</sub>SO<sub>2</sub>, R<sub>4b</sub> is CN, and R<sub>4c</sub> is CF<sub>3</sub>SO<sub>2</sub>.

78. (New) The compound of Claim 74, wherein R<sub>4a</sub>, R<sub>4b</sub>, and R<sub>4c</sub> are independently selected from CN, CF<sub>3</sub>, and CF<sub>3</sub>SO<sub>2</sub>.

79. (New) The compound of Claim 74, wherein R<sub>4a</sub> is F, R<sub>4b</sub> is CN, and R<sub>4c</sub> is F.

80. (New) The compound of Claim 74, wherein R<sub>4a</sub> is CF<sub>3</sub>, R<sub>4b</sub> is CN, and R<sub>4c</sub> is CF<sub>3</sub>.

81. (New) The compound of Claim 74, wherein R<sub>4a</sub> is CF<sub>3</sub>SO<sub>2</sub>, R<sub>4b</sub> is CF<sub>3</sub>SO<sub>2</sub>, and R<sub>4c</sub> is CF<sub>3</sub>SO<sub>2</sub>.

82. (New) The compound of Claim 74, wherein R<sub>4a</sub> is CN, R<sub>4b</sub> is CF<sub>3</sub>SO<sub>2</sub>, and R<sub>4c</sub> is CF<sub>3</sub>SO<sub>2</sub>.

### REMARKS

Claims 9-64 are pending in the application. Claims 11, 12, 14, 16, 19, 20, 23-28, 30 and 35-64 have been withdrawn from consideration as directed to either a non-elected invention (Claims 35-64) or directed to a non-elected species (Claims 11, 12, 14, 16, 19, 20, 23-28, and 30). Claims 9, 10, 13, 15, 17, 18, 21, 22, 29, and 31-34 have been rejected. Claims 29 and 31 have been amended. Claims 65-82 have been added. Claims 9-28, 30, and 35-64 have been canceled without acquiescence to the Examiner's rejection of these claims, without abandonment of the subject matter defined by these claims, or without prejudice to applicants to seek patent protection for the subject matter defined by these claims in an application for patent to be filed in the future. Reconsideration and allowance of Claims 29, 31-34, and 65-82 in view of the above amendments and following remarks is respectfully requested.

#### The Rejection of Claims 9, 10, 13, 15, 17, 18, 21, 22, 29, and 31-34

##### Under 35 U.S.C. § 112, First Paragraph

Claims 9, 10, 13, 15, 17, 18, 21, 22, 29, and 31-34 stand rejected under 35 U.S.C. § 112, first paragraph, on the grounds that the specification, while enabling for compounds disclosed with a disclosed  $\pi$ -electron donor groups,  $\pi$ -conjugate polyene bridge, and  $\pi$ -electron acceptor groups, does not reasonably provide enablement for all compounds claimed. The Examiner is of the opinion that the claims read on compounds that are neither disclosed nor contemplated by the specification. Withdrawal of the rejection is requested for the following reasons.

Claims 9, 10, 13, 15, 17, 18, 21, and 22 have been canceled.

Claim 29 has been amended and is an independent claim relating to a compound having a donor group conjugated to an acceptor group that includes a dihydrofuran group through a bridge group that includes a fused dithiophene group.

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Claim 31 is an independent claim relating to a compound having a donor group conjugated through a bridge group to an acceptor group having the recited dihydrofuran structure. Claims 32-34 depend from Claim 31 and recite specific substituents for the acceptor group.

Applicants submit that the specification enables the scope of independent Claims 29 and 31, and dependent Claims 32-34. The specification enables one skilled in the art to make and use chromophore compounds having a donor group conjugated to an acceptor group through a bridge group. The specification is replete with examples of donor groups, acceptor groups, and bridge groups, as well as synthetic methods and techniques for making chromophores having a donor group conjugated to an acceptor group through a bridge group. Moreover, the specification describes with particularity chromophores having a donor group conjugated to an acceptor group that includes a dihydrofuran group through a bridge group that includes a fused dithiophene group (Claim 29), and chromophores having a donor group conjugated through a bridge group to an acceptor group that includes the recited dihydrofuran group (Claims 31-34).

Regarding the compounds of Claim 29, the acceptor group is described at page 13, the bridge group is described at page 15. Methods for making these compounds are described in the application, for example, FIGURE 4 describes a general synthetic procedure for making compounds that include the fused dithiophene bridge, Example 2 provides a synthetic procedure for making a representative compound having the recited bridge and acceptor groups (see FIGURES 12 and 13), Example 7 provides a synthetic procedure for making a representative compound having a fused dithiophene bridge and dihydrofuran acceptor (see FIGURES 26 and 27), Example 10 provides a synthetic procedure for making a representative compound having a fused dithiophene bridge and dihydrofuran acceptor (see FIGURE 45), Example 11 provides a synthetic procedure for making a representative

compound having a fused dithiophene bridge and dihydrofuran acceptor (see FIGURE 46), Example 12 provides a synthetic procedure for making a representative compound having a fused dithiophene bridge and dihydrofuran acceptor (see FIGURE 47), and Example 13 provides a synthetic procedure for making a representative compound having a fused dithiophene bridge and dihydrofuran acceptor (see FIGURE 48).

Regarding the compounds of Claims 31-34, the acceptor group is described at page 13. Methods for making representative acceptors is described in Example 5 (see FIGURES 16 and 19). Methods for making compounds that include the acceptors are described throughout the application including in the examples and figures.

Because the specification provides a detailed description of how to make and use the compounds defined by Claims 29 and 31-34, the specification is enabling for the scope of these claims. Withdrawal of this grounds for rejection is respectfully requested.

The Rejection of Claims 9, 10, 13, 15, 17, 18, 21, 22, 29, and 31-34

Under 35 U.S.C. § 112, Second Paragraph

Claims 9, 10, 13, 15, 17, 18, 21, 22, 29, and 31-34 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner states that it is unclear how the  $\pi$ -electron donor groups,  $\pi$ -conjugate polyene bridge, and  $\pi$ -electron acceptor groups are conjugated. The Examiner states that in Claims 15, 22, and 31-34, the definition of "R" as the rest of the compound is vague and indefinite. Withdrawal of the rejection is respectfully requested for the following reasons.

Claims 9, 10, 13, 15, 17, 18, 21, and 22 have been canceled.

Claim 31 has been amended by deleting reference to R and by deleting R from the recited structure.

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Applicants submit that the claims are definitive with regard to how the  $\pi$ -electron donor groups, bridge, and  $\pi$ -electron acceptor groups are conjugated. As used throughout the specification and claims, the term "conjugated" is used in its traditional organic chemical sense and refers to  $\pi$ -electron delocalization. The compounds of the present invention include delocalized  $\pi$ -electron systems that extend from the compounds' electron donor groups to the compounds' electron acceptor groups through the compounds' bridge groups by way of the  $\pi$ -electron system. In each and every one of the compounds of the invention, the donor group is conjugated to the acceptor group through the bridge group; that is, each compound has a  $\pi$ -electron system that is delocalized from the donor to the acceptor through the bridge. The extended  $\pi$ -electron system of these compounds results from the overlap of carbon p-type orbitals from the donor to the acceptor through the bridge. The extended  $\pi$ -electron system imparts these compounds with their high polarizability.

Claim 29 relates to such donor-bridge-acceptor compounds having a fused dithiophene group in the compounds' bridge component. Representative compounds having a fused dithiophene group in the bridge component are illustrated in FIGURES 12, 14, 21, 26, and 45-47. The extended  $\pi$ -electron systems of these compounds (i.e., their conjugation) also is readily apparent from these figures.

Claim 31 relates to donor-bridge-acceptor compounds having the recited dihydrofuran acceptor group. Claims 32-34 depend from Claim 31. Representative compounds having the recited dihydrofuran acceptor group are illustrated in FIGURES 1, 2, 15, 16, 17, 19, 21, and 47. Again, the extended  $\pi$ -electron systems of these compounds (i.e., their conjugation) is readily apparent from these figures.

Because the nature of the claimed compounds is clear with regard to their donor-bridge-acceptor components, and because Claim 29 relates to such compounds having a

specific bridge component (i.e., bridge includes a fused dithiophene group) and Claim 31 relates to such compounds having a specific acceptor component, the claimed invention is definite. Withdrawal of this grounds for rejection is respectfully requested.

The Rejection of Claims 9, 10, 13, 15, 17, and 18 Under 35 U.S.C. § 102(e)

Claims 9, 10, 13, 15, 17, and 18 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,067,186, issued to Dalton et al. Claims 9, 10, 13, 15, 17, and 18 have been canceled. Withdrawal of this grounds for rejection is respectfully requested.

The Rejection of Claims 9, 10, 13, 15, 17, and 18 Under 35 U.S.C. § 102(a)

Claims 9, 10, 13, 15, 17, and 18 stand rejected under 35 U.S.C. § 102(a) as being anticipated by WO 00/09613 (Pacific Wave). Claims 9, 10, 13, 15, 17, and 18 have been canceled. Withdrawal of this grounds for rejection is respectfully requested.

The Rejection of Claims 9, 10, 13, 15, 17, and 18 Under 35 U.S.C. § 102(b)

Claims 9, 10, 13, 15, 17, and 18 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,676,884, issued to Tiers et al. Claims 9, 10, 13, 15, 17, and 18 have been canceled. Withdrawal of this grounds for rejection is respectfully requested.

The Rejection of Claims 9, 13, 17, 21, and 29 Under 35 U.S.C. §§ 102(b)/103(a)

Claims 9, 13, 17, 21, and 29 stand rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 5,514,799, issued to Varanasi et al. Withdrawal of the rejection is respectfully requested for the following reasons.

Claims 9, 13, 17, and 21 have been canceled.

As amended, Claim 29 is directed to a compound having a donor group conjugated to an acceptor group that includes a dihydrofuran group through a bridge group that includes a fused dithiophene group.

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The Varanasi reference describes 1,1-disubstituted vinyl nonlinear optical materials. These materials include compounds having an electron withdrawing moiety conjugated to an electron donating moiety. Examples 14 and 15 of the reference depict compounds in which the electron donating moiety (dithiane) is conjugated to an electron withdrawing moiety (tricyanovinyl) through a fused dithiophene group.

The cited reference differs from the invention as now claimed because the cited reference fails to describe a compound that includes a fused dithiophene bridge and a dihydrofuran acceptor.

Because the cited references fails to exactly describe the claimed invention, the reference is not anticipatory. Withdrawal of this grounds for rejection is respectfully requested.

The cited reference fails to teach, suggest, provide any motivation to make, or otherwise render obvious the invention as now claimed. Electron withdrawing groups described in the reference include nitro, cyano, formyl, keto, ester, phosphate ester, phosphite ester, sulfonate ester, and sulfinate ester groups, N,N-dialkylbarbituric acids, N,N-dialkylthiobarbituric acids, rhodamines, hydantoin, oxazolines, 3-cyanovinylindane-1-sulfone, 1,3-bis-sulfonylindane, indane-1,3-dione, 3-dicyanovinylindane-1-one, and 1,3-bisdicyanovinylindane. The reference fails to teach or suggest a dihydrofuran group as an electron withdrawing group (i.e., acceptor).

Because the cited reference fails to teach, suggest, provide any motivation to make, or otherwise render obvious the invention as claimed, the claimed invention is nonobvious and patentable over the cited references. Withdrawal of this grounds for rejection is respectfully requested.

The Rejection of Claims 18 and 22 Under 35 U.S.C. § 103(a)

Claims 18 and 22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,514,799, issued to Varanasi et al., in view of U.S. Patent No. 5,432,286, issued

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to Cabrera et al. Claims 18 and 22 have been canceled. Withdrawal of this grounds for rejection is respectfully requested.

Allowable Subject Matter

The indication of allowable subject matter is noted with appreciation. The Examiner states that claims limited to the elected species are deemed allowable and notes, for example, the compounds of FIGURES 21 and 47. For the same reasons as noted by the Examiner, applicants believe that the compounds illustrated in FIGURES 26, 45, and 46 are also allowable. Claims 70-73 have been added directed to these species.

New Claims 65-69

Claims 65-69 have been added. Claims 65-69 depend from Claim 31 and recite specific substituents for the acceptor. Support for the subject matter of the new claims can be found throughout the specification as originally filed.

New Claims 74-82

Claims 74-82 have been added. Claims 75-82 depend from Claim 74. Claim 74 is directed to a substituent that is useful as an electron acceptor group in nonlinear optical materials. Claim 74 recites the same structure as recited in Claim 31. Support for the subject matter of the new claims can be found throughout the specification as originally filed.

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CONCLUSION

In view of the above amendments and foregoing remarks, applicants believe that Claims 29, 31-34, and 65-82 are in condition for allowance. If any issues remain that may be expeditiously addressed in a telephone interview, the Examiner is encouraged to telephone applicants' attorney at 206.695.1755.

Respectfully submitted,

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Date:

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The following have been received in the U.S. Patent and Trademark Office on the date stamped hereon via first-class mail, with a signed Certificate of Mailing:

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